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DESCRIPTION

(Elastic fabric and Elastic top material)

Technical Field

【0001】

The present invention relates to an elastic top material which is used as pillow, cushion, bench, backrest, armrest, chair, seat bed, mattress and a like, all of which are used for supporting ones limbs, by weighting or weighing on or sitting in.

Background Art

【0002】

This kind of elastic top materials is formed by covering such a porosity construction as urethane foam or other resin foams, or by covering stratified formations which are formed by stratifing polyester fiber or other fibers, with such a flexible top material as fabric, leather and a like. This kind of elastic top materials are also formed by covering a spring construction formed from flat springs, coil springs or other springs together with such a flexible top material as fabric, leather and a like.

【0003】

A conventional elastic top material effects agreeable soft feeling, when ones limbs are weighted thereon due to balancing of pressed strain, which may be raised in its thickness direction, and elastic recovery force which may be raised in accordance with the pressed strain. However, in the cace where the pressed strain rises relatively too little in comparison with elastic recovery force, hard and painfulfeeling may be effected. On the other hand, in the cace where the pressed strain rises relatively too more in comparison with the elastic recovery force , fatiguee feeling may be effected since limbs are supported unstable.

Since the conventional elastic top material effects agreeable soft feeling due to the balancing of pressed strain and elastic recovery force as that, the conventional elastic top material have to be formed in thick.

So that, the conventional elastic top material is thick and hard for carry and occupies good deal of space since it is bulky and hindrance when it is at no use. In this connection, it needes to improve the conventional elastic top material.

【0004】

Therefore, the present invention is intended to provide an improved elastic top material which limbs are supported stably thereon, and which is sthick, thin, light weight and less bulky as a whole, and which is easy to deal with.

Disclosure of Invention

【0005】

An elastic fabric of the present invention is characterized by following matters.

(i) an elastic yarn is applied to warp yarns or weft yarns.

(ii) breaking elongation of the elastic yarn is more than 60 %, and rate of an elastic recovery after 15 % elongation of the elastic yarn is more than 90 %.

(iii) the elastic fabric has stress at 10% elongation of more than 150 N/5 cm and less than 600 N/5 cm in the direction (X) where the elastic yarn is in continuous without cut inside of the elastic fabric.

(iv) rate of hysteresis loss ΔE which is calculated by the equation $\Delta E = 100 \times C / V = 100 \times (V - W) / V$ is 20 ~45 % ($20 \leqq \Delta E \leqq 40$).

At this ;

(i) V is an integral value which is calculated by integrating the load-elongation equation ($f_0(\rho)$) from 0 % to 10 % elongation in the direction (X) where the elastic yarn is in continuous without cut inside of the elastic fabric, where the load-elongation equation($f_0(\rho)$) is defined by the loading curve (f_0) of the hysteresis in the load-elongation diagram.

(ii) W is integral value which is calculated by integrating the load-elongation equation ($f_0(\rho)$) from 10 % to 0 % elongation in the direction (X) where the elastic yarn is in continuous without cut in the elastic fabric, where the load-elongation equation ($f_0(\rho)$) is

defined by the load-reducing curve (f_1) of the hysteresis in the load-elongation diagram.

(iii) $C = V - W$ is value of hysteresis loss which is calculated as the difference of the values between the integral values V and W .

Brief Description of Drawings

【0006】

Figures 1～4 are plain views of elastic fabrics in accordance with the present invention.

Figure 5 is a sectional view of an elastic fabric in accordance with the present invention.

Figure 6 is a load-elongation diagram of an elastic fabric in accordance with the present invention.

Figure 7 is a perspective view of an elastic fabric in accordance with the present invention.

Figures 8～9 are plain views of elastic fabrics in accordance with the comparison of the present invention.

Figures 10～20 are perspective views of elastic fabrics in accordance with the present invention.

Best Mode for Carring Out the Invention

【0007】

One preferable modified embodiment of the present invention is to set up(design) density of bulk($J = T \times G$; dtex/cm) more than 17000 dtex/cm.

At this, the density of bulk ($J = T \times G$) is defined as product value of average fineness of an elastic yarn (T; dtex/number) and a density of an arrangement of the elastic yarn ($G = M / L$; number/cm) which is calculated by dividing a number of elastic yarns(M; number) by regular intervals(L; cm) in the orthogonal direction(Y) cross at right angles to the prolonging direction(X) where elastic yarns(11) prolong.

【0008】

Other preferable modified embodiment of the present invention is to set up(design) covering rate(K) more than 30 % ($K = 100 \times M \times D/l \geqq 30$ %) .

At this, the covering rate(K) is defined by dividing product value (M × D) of average diameter of the elastic yarn (D ; cm), which is defined by square root of a product value(S×k) of modulus of elasticity($k = 4 \times \pi^{-1}$) and the areas(S ; cm^2) of the cross section of the elastic yarns which are disposed in the regular intervals(L ; cm) in the direction (Y) which is cross at right angles to the prolonging direction(X) where the elastic yarns(11) prolong, and number(M) of the elastic yarns which are disposed in the regular intervals(L;cm) by the regular intervals (L : cm).

【0009】

In the case of a woven elastic fabric(10), elastic yarns may be applied to either warp yarns or weft yarns, inelastic yarns may be used for another. That is, inelastic yarns may be used for intersecting yarns(22) which is cross the elastic yarns(11) at right angles.

It is preferable to apply for the woven elastic fabric such a weaving textile design, where the continuity direction(R) of intersections(20) draw zigzag lines or radial lines, as pointed twill weaves, entwining twill weaves, herring-bone twill weaves, skip draft twill weaves, and modified twill weaves, or such a weaving textile design, of which rate of the intersection(H=P/m) is less than 0.5, as mat weaves, matt weaves, basket weaves , hopsack weaves, warp-weft weaves, irregular or fancy mat weaves, stitched mat weaves and other modified plain weaves (Figure 4).

【0010】

It is desirable to design the woven elastic fabric(10) in a manner where rate of the intersection(H=P/m), which is defined by dividing the number(P) of bending points(p-1, p-2, p-3, p-4·········) in front and/or in rear of intersections(20) in complete textile design of the woven elastic fabric(10) where the elastic yarn(11) and the intersecting yarn (22) bend and change their dispositions one another from surface side to back side or from back side to surface side, by the number(m) of the intersecting yarns(22), which consist complete textile design, is to be less than 0.5 ($H = P/m \leqq 0.5$) (Figure 5).

It is also desirable to design the woven elastic fabric(10) in a manner where product value(H ×K) of rate of an intersection(H) and covering rate(K) of the elastic yarn(11) is to be more than 0.1 ($H \times K \geqq 0.1$).

【0011】

It is further desirable to design the woven elastic fabric(10) in a manner where density of bulk(J; dtex/cm) of the elastic yarn (11) is to be from 0.5 to 3.0 times density of bulk(j; dtex/cm) of the intersecting yarn(22) which is an inelastic yarn and is cross the elastic yarn(11) at right angles ($0.5 \times j \leqq J \leqq 3.0 \times j$).

At this, the bulk(J; dtex/cm) of the elastic yarn is calculated as a product value of average fineness(T; dtex) and density of the arrangement(G= n/L ; number/cm) of the elastic yarn(11) which is calculated by dividing number of elastic yarns (n; number) with the regular intervals(L; cm) in the orthogonal direction(Y) cross at right angles to the direction in which the elastic yarns(11) prolong.

In the same way, the bulk(j; dtex/cm) of the intersecting yarn(22), which is an inelastic yarn, is calculated as product value of average fineness(t; dtex) and density of the arrangement($g = m / L$; number /cm) of the intersecting yarn(22) which is calculated by dividing the number of intersecting yarns (m; number) by the regular intervals(L; cm) in the prolonging direction(X) where the elastic yarns(11) prolong .

【0012】

An elastic top material(62) is formed by stretching and hanging over the elastic fabric(10), which is applied for supporting limbs, between both frame parts(61a, 61b) which are projected at both sides of a frame(60) in a manner whereboth frame parts(61a, 61b) are in opposite to one another.

The cushioning surface(63) of the elastic top material is formed from the elastic fabric(10) for supporting limbs.

The elastic fabric(10) is stretched over the frame(60) by setting the prolonging direction(X) of the elastic yarn(11) in parallel to the oppositing direction where both frame parts(61a, 61b) are in opposite to one another, that is, by setting the prolonging direction(X) in the width direction of the elastic top material(62).

【0013】

The elastic fabric is designed by incorporating the elastic yarn(11) into the elastic fabric in a manner where the elastic yarns are located in line either in lengthwise or crosswise, so that the elastic fabric has;

(i) stress at 10% elongation (F) is more than 150 N/ 5 cm and less

than 600 N/5cm ($150 \leqq F \leqq 600$; N/5cm) in the prolonging direction(X) where incorporated elastic yarns continuous without cut inside of the elastic fabric,

(ii) stress at 10% elongation (B) in the 45 degrees bias direction (Z), where has inclination of 45 degrees to the prolonging direction(X), is more than 5 % and less than 20 % in comparison with stress at 10% elongation(F) in the prolonging direction(X), and

(iii) rate of hysteresis loss(ΔE) at 10 % elongation in the prolonging direction(X) is within 20～45 % ($20 \leqq \Delta E \leqq 45$)

The elastic top material(62) is formed by stretching over and by fixing both edges of the elastic fabric(10) to the frame parts(61a, 61b) which is projected at both sides of a frame(60) and are in opposite one another. In the elastic top material(62) which is formed as that, the elastic fabric is deflected into arched shape in the prolonging direction(X) of the elastic yarn(11) when limds is put on there.

Simultaneously, the elastic fabric is also deflected into arched shape in the orthogonal direction(Y) cross at right angles to the prolonging direction(X) of the elastic yarn(11) and is transformed into a moderate shape, then, the weight of limbs loaded on is to be dispersed in all directions of the elastic fabric.

So that, the elastic fabric does not effect hard feeling but recovers it's original form as soon as the weight of limbs is put away. And, a load mark does not remain where the limbs have been put on for a long time.

【0014】

In the case of that stress at 10% elongation(F) of the elastic fabric is designed less than 150 N/5cm, sagging of the elastic fabric due to the weight of limbs increases and the periphery of sagged portion of the elastic fabric effects cramped feeling.

And, the elastic fabric becomes hard for recovering it's original form after the weight of limbs was put away.

And, a load mark which may be effected by the weight of limbs tends to remain over the elastic fabric results from load-hysteresis fatigue due to the delay in recovering of the original form.

On the other hand, in the case of that stress at 10% elongation(F) of the elastic fabric is designed more than 600 N/5cm, it becomes unbearable to

put limbs on the elastic fabric for a long time, since the elastic fabric effects hard feeling.

In the present invention, a reason to design rate of hysteresis loss (ΔE) at 10 % elongation within 20 ~45 % ($20 \leqq \Delta E \leqq 45$) is that when it is designed less than 20 %, an elastic peculiarity of the elastic fabric becomes similar to that of steel spring and the elastic fabric tends to effect hard feeling though it's elasticity.

On the other hand, in the case of that the rate of hysteresis loss (ΔE) at 10 % elongation is designed more than 45 % , the elastic fabric effects bottomed sticky feeling when limbs are put on it, and it becomes hard to recover it's original form, and load mark tends to appere over the elastic fabric after limbs was put away. Then, it becomes hard to obtain cushioning goods which are rich in soft feeling and load-hysteresis fatigue resistance.

In consideration of these matters, the elastic fabric is designed so that stress at 10% elongation(F) becomes to 200~400 N/5cm and rate of hysteresis loss(ΔE) at 10 % elongation becomes about 25 %.

【0015】

The rate of hysteresis loss ΔE is calculated by dividing a hysteresis loss (C) by value(V). At this;

The value of hysteresis loss(C) is calculated as the difference between values (V) and (W).

The value (V) is calculated by integrating the load-elongation equation $f_0(\rho)$ from at 0 % to at 10 % elongation in the direction(X) where the elastic yarn is in continuous without cut in the elastic fabric, where the load-elongation equation $f_0(\rho)$ is defined by the loading curve(f_0) of the hysteresis in the load-elongation diagram.

The integral value (W) is calculated by integrating the load-elongation equation $f_0(\rho)$ from at 10 % to at 0 % elongation in the direction (X) where the elastic yarn is in continuous without cut in the elastic fabric, where the load-elongation equation $f_0(\rho)$ is defined by the load-reducing curve (f_1) of the hysteresis in the load-elongation diagram.

Detailed calcuration of the rate of hysteresis loss(ΔE) at 10 % elongation is explained as follow.

(i) A test piece with 50mm width and 250mm length which is cut out from the elastic fabric is set by setting a distance between grips 150mm in a

load-elongation testing machine where loading-elongating velocity is adjusted in 150mm/min. and an initial load is adjusted in 4.9 N.

(ii) The test piece is pre-elongated 10% by loading.

(iii) The test piece is conditioned by decreasing load till initial load.

(iv) After the conditioning, the test piece is elongated 10 % and the loading curve(f_0) of the hysteresis is drawn in the cartesian coordinate with the elongation axis ($X\rho$) and the load axis(Y_F).

Subsequently, load decreases till initial load(F_0) and the load-reducing curve(f_1) is drawn (Fig. 6).

In the cartesian coordinate, the loading hysteresis area(V), which is enclosed with the loading curve(f_0), the line($F_{10}-\rho_{10}$) which passes through at 10% elongation loading point(F_{10}) and crosses at right angles to the elongation axis ($X\rho$), and the elongation axis($X\rho$), is measured.

Also, the reducing hysteresis area(W) which is enclosed with the load-reducing curve (f_1), the line($F_{10}-\rho_{10}$) which passes through at 10 % elongation loading point(F_{10}) and crosses at right angles to the elongation axis($X\rho$), and the elongation axis($X\rho$), is measured.

The hysteresis loss (C) is calculated as a difference(V−W) between the loading hysteresis area(V) and the reducing hysteresis area (W).

Then, the rate of hysteresis loss(ΔE) is calculated by dividing the hysteresis loss(C) with the loading hysteresis area(V) .

【0016】

A reason to design stress at 10% elongation(B) in the 45 degrees bias direction(Z), where has inclination of 45 degrees to the prolonging direction(X), to more than 5 % and less than 20% in comparison with stress at 10% elongation(F) in the prolonging direction(X) is explained as follow.

That is, in the case where stress at 10% elongation(B) in the 45 degrees bias direction(Z) becomes less than 5 % of the stress at 10% elongation(F) in the prolonging direction(X), where the elastic yarn is in continuous, the elastic fabric becomes hard to recover its original form after the limbs was put away, and knitting textile designs or weaving textile designs of the elastic fabric becomes transformable, that is, a distortion of so-called textile opening tends to raise due to slipping of yarns(11, 22).

On the other hand, in the case where stress at 10% elongation(B) in the 45 degrees bias direction(Z) becomes more than 20 % of the stress at 10%

elongation(F) in the prolonging direction(X), the elastic fabric tends to be effected hard feeling, since the distortion of knitting or weaving textile designs of the elastic fabric becomes hard arising , the weight of limbs loaded on the elastic fabric is not dispersed in all directions, and sagged recess are hardly formed according to the shape of limbs at the portion where limbs was put on, then limbs are in movable and are not supported in stable manner.

【0017】

A reason to design the density of bulk($J = T \times G$; dtex/cm) of the elastic yarn(11), which is defined as product value of average fineness of an elastic yarn (T; dtex/number) and density of the arrangement of the elastic yarn ($G \doteqdot M/L$; number/cm) , more than 17000 dtex/cm, is explained as follow.

That is, in the elastic fabric, when the elastic yarns are in parallel and neighboring so closely as to touch one another, and when each of them does not stretch independently, and when tensile stress acts every one of them, the tensile stress is propagated and acts others which are in neighboring.

In such a way, weight of limbs is propagated from one to another in order. So that, only a few elastic yarns(11) does not slipe at the extremely limited portion of the elastic fabric.

Then, the elastic fabric is to be designed so that somewhat distortion of the knitting or weaving textile designs is caused slightly by a lot of elastic yarn as far as the elastic fabric turns into it's original form after the limbs(or load or weight) was put away.

In accordance with such a way, the elastic fabric becomes rich in load-hysteresis fatigue resistance and load mark becomes hardly remain the portion where limbs was put on for a long time.

In consideration of these matters, the density of bulk($J = T \times G$;dtex/cm) of the elastic yarn(11) is to be designed more than 17000 dtex/cm, thus stress at 10% elongation(F) in the prolonging direction(X), where the elastic yarn(11) is in continuous, is to be designed more than 150N / 5cm and less than 600 N/ 5cm, and stress at 10% elongation(B) in the 45 degrees bias direction(Z) is to be designed more than 5 % and less than 20 % .

As a result, it becomes easily to set up rate of hysteresis loss(ΔE) at 10 % elongation in the prolonging direction(X) within 20 ~45 % .

【0018】

Form the same reason, the covering rate(K) of the elastic yarn(11) is set up more than 30 %.

Especially, in the case where the covering rate(K) of the elastic yarn (11) is set up more than 30 %, a lot of elastic yarns, which are arranged in dence, accelerates to elongate the intersecting yarn(22), which is cross the elastic yarns(11) at right angles. Since such a lot of elastic yarns acts as if it were a wedge which was picked into an arrangement which is formed by the intersecting yarns(22).

Therefore, weight of limbs is easily propagated between every adjacent elastic yarns in order from one to another through the intersecting yarns (22).

As a result, the elastic fabric becomes rich in elastical transformablity so as to fit the shape of limbs which are put thereon and also becomes rich in soft feeling and load-hysteresis fatigue resistance.

【0019】

The elastic yarn(11) is woven or knitted in the elastic fabric in a manner to be in continuous intermittently in the width direction of the fabric or through the full width of the fabric, or in a manner to be in continuous intermittently in the length direction of the fabric or through the full length of the fabric.

It is desirable to set up the density of bulk(J) of the elastic yarn more than 17000 dtex/cm by designing the average fineness(T) of the elastic yarn in thick and by designing the density(G) of the arrangement of the elastic yarn in loose so that the arranged situation of the elastic yarn is easily kept in line.

It is also desirable to compose the elastic yarn as a type of monofilament yarn so that the arranged situation of the elastic yarn is easily kept in line.

However, in the case of that the elastic yarn is composed of multiple fibers or yarns as a type of multifilament yarn, the number of the fibers or the number of single yarns of the elastic yarn should be set up less than 5 (threads).

That is, the elastic yarn should be composed of several thick monofilament yarns in a shape as if these yarns were drawn in parallel.

The elastic yarn may be composed together with elastic fibers and inelastic fibers in seath core shape by twining and covering the elastic fibers with the inelastic fibers.

【0020】

Figures 1~4 show examples of the textile design of the elastic fabrics.

In the elastic fabric shown in Figure 1 , the inelastic yarns(the intersecting yarns(13) form base weft knitted fabric. The elastic yarns (11) are threaded in the base weft knitted fabric and pass under the space between the needle loops (40, 40) of every neighboring wales in each course and are continuous in line in the knitting width direction(Γ).

In the elastic fabric shown in Figure 2, the inelastic yarns (the intersecting yarns(13) form the base warp knitted fabric. The elastic yarns(11) are threaded in the base weft knitted fabric and pass through the space between the needle loop(40) and the sinker loop(50) and are in continuous in line in the knitting width direction(Γ).

In the elastic fabric shown in Figure 3, the base warp knitted fabric is formed with the inelastic yarns(13x) which form the chain stitched rows in line in the knitting length direction and the inelastic inserted yarns (the intersecting yarns 22a) which are connecting the adjacent chain stitc hed rows. The elastic yarns(11) are threaded in the base warp knitted fabric and pass through the space between the adjacent chain stitched rows (39, 39) in a manner of passing over the inelastic inserted yarn (22a) and passing under the inelastic inserted yarn (22a) in each course and are in continuous in line in the knitting length direction(Σ).

【0021】

As shown in Figures 1~ 3, in the elastic knitted fabric, it is desirable to apply the inelastic yarn to all of the intersecting yarns(22) which cross the elastic yarn(11) which is continuous in line.

Also, as shown in the Figures 1~ 3, in the elastic knitted fabric, the elastic yarn(11) may be arranged in line weftwise and warpwise.

However, in the elastic woven fabric, in consideration of easiness in weaving process, it is desirable to apply an elastic yarn(11) to the weft yarn, and to apply an inlastic yarn to the warp yarn(that is, the intersecting yarn 22).

Figure 4 shows the elastic woven fabric wherein the elastic yarn is

applied to the weft yarn and the inlastic yarn is applied to the warp yarn.

【0022】

The elastic knitted fabric is transformable lengthwise and crosswise, since the base warp knitted fabric is formed with arched needle loops(40) and arched sinker loops(40) where the yarns are bent into arched shape.

Therefore, there is not a special difference between stress at 10% elong ation (B_1) in the 45 degrees leftwise bias direction(Z_1), where has left-wise inclination of 45 degrees against the prolonging direction(X), and stress at 10% elongation(B_2) in the 45 degrees rightwise bias direction(Z_2), where has rightwise inclination of 45 degrees against the prolonging direction(X). Thus, weight of limbs, which is loaded on the elastic knitted fabric, disperse in all directions.

In this connection, however, in the elastic woven fabric, the difference between stress at 10% elongation(B_1) in the 45 degrees leftwise bias direction(Z_1) and stress at 10% elongation(B_2) in the 45 degrees rightwise bias direction(Z_2) becomes larger in accordance with a manner of the continuity of the intersection points(20) in the weaving textile design.

Therefore, the elastic woven fabric becomes lacking in load-hysteresis fatigue resistance in comparison with the elastic knitted fabric in accordance with the difference of stress at 10% elongation between the 45 degrees leftwise bias direction(Z_1) and the 45 degrees rightwise bias direction(Z_2).

To decrease the difference of stress at 10% elongation , the satin weave which lacks course of action in the disposion of the intersection points (20) may be applied to the elastic woven fabric.

However, by the application of the satin weave, the elastic woven fabric which is rich in load-hysteresis fatigue resistance is not obtained, since the satin weave lacks fixedness between the warp yarn and the weft yarn, so that stress is hardly propagated from one to another in order between adjacent elastic yarns.

【0023】

Thus, weaving textile designs where the intersection points(20) are disposed in zigzag and/or radial manner in the continuity direction(R) such as pointed twill weaves, entwining twill weaves, herring-bone twill weaves, skip draft twill weaves and modified twill weaves or weaving textile

designs of which rate of the intersection($H = P/m$) is less than 0.5 such as mat weaves, matt weaves, basket weaves, hopsack weaves, warp-weft weaves, irregular or fancy mat weaves, stitched mat weaves and other modified plain weaves are applied to the elastic woven fabric.

In the elastic woven fabric which is applied such a weaving textile design, the intersection points(20) continue in the 45 degrees leftwise bias direction(Z_1) and in the 45 degrees rightwise bias direction(Z_2) at same rate, as a result, fixednesses between the warp yarn and the weft yarn are kept, and the manners of the continuity of the intersection points(20) in the 45 degrees leftwise bias direction(Z_1) and in the 45 degrees rightwise bias direction(Z_2) become even.

Therefore, large difference of stress at 10% elongation (B) between those bias directions(Z_1, Z_2) does not rise , and load-hysteresis fatigue resistance of the elastic woven fabric increases.

【0024】

Further, for increment of the load-hysteresis fatigue resistance of the elastic woven fabric, covering rate(K) of the elastic yarn(11) is to be set up more than 30 % so as to make a slipe between the elastic yarns minimize for reasons of that the elastic yarns(11a, 11b, 11c·········) stick fast one another being collected between the intersection points(20m, 20n) by potential inside shrinking stress of the intersecting yarns(22) which is effected as a reaction stress when the intersecting yarns(22) are elongated between the intersection points(20m, 20n) result from or through or by the elastic yarns(11a, 11b, 11c ·········) .

However, in the case of that covering rate(K) of the elastic yarn(11) is set up more than 30 % , when the fineness of the elastic yarn is set up so thicker than regular fineness which shoud be set and limited in proportion to the weaving density, the elastic fabric which is rich in load-hysteresis fatigue resistance can not be always obtained.

【0025】

The reason for this is explained as follow.

When the density of the warp of the woven fabric is designed(set up) high dence(tight), a plurality of warp yarns(22a, 22b, 22c ·········), which compose the complete textile design of the woven fabric, are in restricted situation to maintain(keep) the width of the arrangement of the warp yarns

between the intersections(20a, 20b) by the weft yarns(elastic yarn 11).

On the other hand, the weft yarn(11) is set under stretched situation due to the reaction from a plurality of warp yarns(22a, 22b, 22c ………) which are arranged in high dense(tight) between the intersections(20a, 20b) and which take an action to widen the width of the arrangement of the warp yarns.

In the case of a plain and fine woven fabric of which density of the warp is set up high dense, balance between the restricted situation of the weft yarn(11) and the arranged situation of warp yarns(22a, 22b, 22c) is kept, and plain situation of fabric are to be maintained.

However, when the number of the warp yarns(22a, 22b, 22c) are so more than the regular limitation, protuberance apperes over the surface of the woven fabric. Since, (1) the weft yarn(11) is brought into extremely strained situation at inside of the woven fabric, (2) potential inside shrinking stress, which is to act to restore the regular length of the weft yarn(11) in proportion to the regular number of warp yarns(intersecting yarns 22a, 22b, 22c), arises at inside of the woven fabric, (3) then, the weft yarn (11) is to be brought into the situation where it intends to shrinke, (4) on the other hand, the plurality of warp yarns(22a, 22b, 22c) is also to act to restore the regular width between the intersections(20a, 20b) in proportion to the regular number of warp yarns, (5) as a result, the warp yarn (22) tends portionally to swell out in the thickness direction of the woven fabric.

As explained above, in the case where the density of the warp of the woven fabric is designed(set up) so denser(more tight) than the regular density which should be suitablly designed(set up) in proportion to the fineness of yarn, the regular plain surface of the woven fabric is not maintained(kept).

It is the same in the case where the density of the weft is designed (set up) so denser(more tight) than the regular density which should be suitablly designed(set up) in proportion to the fineness of the weft yarn(11).

【0026】

The reason to design(set up) the rate of the intersection(H) less than 0.5 is that the intersecting yarns(22) which cross to the elastic yarn

(11) is not so far elongated between the intersections(20m, 20n) that the undulatory puckers or climps appere over the surface of the elastic fabric.

That is, the case, where the rate of the intersection(H) is more than 0.5, means such a case where frequency of forming of the intersection point(20) formed together with the warp yarns(22) and the weft yarns(elastic yarn 11) is few, and also means such a case where the warp yarns(22) passes over a lot of weft yarns(elastic yarn 11) and float out of the surface of the elastic fabric..

In the case where the length(U) of the floating portion of the warp yarn is long, elongate action which acts from a plurality of the elastic yarns (11a, 11b, 11c·········) to the warp yarn(22) between the intersections(20m, 20n) may be diminished.

Hoowever, in such a case, a plurality of the elastic yarns(11a, 11b, 11c) which may be included between the intersections(20m, 20n) becomes freely since the elastic yarns(11a, 11b, 11c) are not tightly restricted by the intersecting yarn(22), consequently, weight of limbs loaded on the elastic fabric cannot be easily propagated from one of the elastic yarns to another elastic yarn between adjacent elastic yarns in order .

【0027】

Therefore, for increasing of load-hysteresis fatigue resistance of the elastic woven fabric,

(i) rate of the intersection($H=P/m$), which is defined by dividing the number of bending points(p-1, p-2, p-3, p-4·········) in front and/or in rear of the intersection(20) in complete textile design of the woven elastic fabric(10), where the elastic yarn(11) and the intersecting yarn(22) bend and change their dispositions from surface side to back side or from back side to surface side each other, by the number of the intersecting yarns(22) which consist the complete textile design, is designed less than 0.5 ($H = P/m \leqq 0.5$), and

(ii) product value ($H \times K$) of rate of an intersection(H) and covering rate(K) of the elastic yarn(11) is designed more than 0.1 ($H \times K \geqq 0.1$).

Further preferably, for increasing of load-hysteresis fatigue resistance of the elastic woven fabric,

(iii) density of bulk(J ; dtex/cm) of the elastic yarn (11) is designed from 0.5 to 3.0 times of density of bulk(j ; dtex/cm) of the intersecting yarn(22) which is an inelastic yarn and crosses to the elastic yarn(11) at right angles ($0.5 \times j \leqq J \leqq 3.0 \times j$).

At this, bulk(J ; dtex/cm) of the elastic yarn is calculated as product value of average fineness(T ; dtex) and density of the arrangement($G = n / L$; number/cm) of the elastic yarn(11) which is calculated by dividing the number of elastic yarns(n ; number) with regular intervals(L ; cm) in the orthogonal direction(Y) crossing at right angles to the direction where the elastic yarns (11) prolong.

In the same way, bulk(j ; dtex/cm) of the intersecting yarn(22), which is an inelastic yarn, is calculated as product value of average fineness(t ; dtex) and density of the arrangement($g = m / L$; number /cm) of the intersecting yarn(22) which is calculated by dividing the number of intersecting yarns(m; number) by the regular intervals(L ; cm) in the prolonging direction(X) where the elastic yarns(11) prolong .

【0028】

The reason to design(set up) the product value ($H \times K$) of the rate of intersection(H) and the covering rate(K) of the elastic yarn(11) more than 0.1 is that weight of limbs loaded on the elastic fabric becomes to be easily propagated from one to another between adjacent elastic yarns in order.

Consequently, adjacent elastic yarns(11, 11) become not to be restricted tightly by the intersecting yarn(22) but proparly become into contact with one another, a weight of limbs loaded comes to disperse all over the elastic fabric, and then, undulatory puckers or climps result from the potential shrinking stress of the intersecting yarn(22) become not to appere over the elastic fabric.

【0029】

Rate of the intersection(H) of elastic yarns may be various in accodance with each of the plural elastic yarns which composes the complete textile design.

Even in such a case, average rate of the intersection(H) of each elastic yarn is designed less than 0.5 , and average product value of average rate of the intersection(H) and covering rate(K) is

designed more than 0.1.

In the case where several kinds of elastic yarns which are different in these finenesses may be applied, average diameter(D) is calculate by dividing total diameter($D_1+D_2+D_3+\cdots\cdots\cdots+D_n$) by the number of the kinds of the elastic yarns.

【0030】

The reason to design(set up) the bulk(J; dtex/cm) of the elastic yarn (11) from 0.5 to 3.0 times of the density of bulk(j; dtex/cm) of the intersecting yarn(22) ($0.5\times j\leqq J\leqq 3.0\times j$) is to maintaine(keep) balance between the arranged situation of the weft yarn and the arranged situation of warp yarns .

It is desirable to design the ratio(J/j) between the bulk(J) of the elastic yarn(11) and the density of bulk(j) of the intersecting yarn(22) 1.0～2.5 , more preferably about 1.0 .

【0031】

To maintain(to keep) the arranged situation of the elastic yarn(11) in line, the fineness of the intersecting yarn(22), which crosses the elastic yarn(11), is to be designed thinner than the fineness of the elastic yarn (11), the density of the arrangement(g) of the intersecting yarn(22) is to be designed denser(more tight), and the ratio(J/j) between the bulk (J) of the elastic yarn(11) and the density of bulk(j) of the intersecting yarn(22) is to be designed 0.5～3.0.

Also, to maintain(to keep) the arranged situation of the elastic yarn(11) in line, it is desirable to apply(use) such a multi-fiber yarn made from multiple fibers as multifilament yarn and spun yarn to the intersecting yarn(22).

Especialy, in the case where the multi-fiber yarn is applied(used) to the intersecting yarn(22), the potential shrinking stress of the intersecting yarn(22) does not act to raise undulatory puckers or climps over the elastic fabric. Since, in the intersecting yarn(22) made from from multiple inelastic fibers, latent potential shrinking stress which might be raised and stored at inside of the intersecting yarn(22) in the weaving process will be relaxed and gradually disappear in accordance with the passage of time, even if the number of the elastic yarns (11) which might be included between the intersections(20m, 20n) is many and the intersecting yarn(22)

might be elongated by a lot of elastic yarns(11) which exist between the intersections(20m, 20n).

Thus, to make the elastic fabric dimensionally stable, it is desirable to apply a multi-fiber yarn to the intersecting yarn(22).

Embodiment〔A－1〕

【0032】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 55/10cm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co. Ltd. "Dia-Flora") is applied to the weft yarn.

The fabric applied the herring-bone twill weaves, shown in Figure 4, is woven with density of the weft 155 / 10cm .

The woven fabric is finished up as an elastic woven fabric by passing through dry-heating treatment at 190℃ × for 3 minutes and by thermally adhering the warp yarn(11) and the weft yarn(22).

The elastic top material(62) is formed by hanging the elastic woven fabric(10) between frame parts and by fixing both edges of the fabric to the frame parts(61a, 61b) which are projected at both sides of a frame(60) apart one another 50 cm and are in opposite to one another(Figure 7) .

The length of the frame part is 45 cm.

The sensory test is put to the elastic top material(62) by sitting on the elastic woven fabric(10).

As a result, the elastic woven fabric(10) was estimated that it effected stable feeling and was good in comfortableness in sitting.

Comparison〔A－1〕

【0033】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 55 / 10cm .

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the weft yarn.

The fabric applied the twill weaves, shown in Figure 8 , is woven with density of the weft 155 / 10cm .

The woven fabric is finished up as an elastic woven fabric by passing through dry-heating treatment at 190℃ × for 3 minutes and by thermally adhering the warp yarn(11) and the weft yarn(22).

The elastic top material(62) is formed by hanging the elastic woven fabric(10) between frame parts and by fixing both edges of the fabric to the frame parts(61a,61b) which are projected at both sides of a frame(60) apart one another 50 cm and are opposite to one another(Figure 7) .

The length of the frame part is 45 cm.

The sensory test is put to the elastic top material(62) by sitting on the elastic woven fabric(10).

As a result, the elastic woven fabric(10) was estimated that it raised a difference of elongation between in the leftwise bias direction and in the rightwise bias direction, effected unstable feeling, and was not so good in comfortableness in sitting.

Comparison〔A－2〕

【0034】

A polyester multifilament yarn(fineness:1333 dtex) is set in warping with density of the warp of 91 / 10cm .

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the weft yarn.

The fabric applied the twill weaves, shown in Figure 8 , is woven with density of the weft 155 / 10cm .

The woven fabric is finished up as an elastic woven fabric by passing

through dry-heating treatment at 190℃× for 3 minutes and by thermally adhering the warp yarn(11) and the weft yarn(22).

The elastic top material(62) is formed by hanging the elastic woven fabric(10) between frame parts and by fixing both edges of the fabric to the frame parts(61a, 61b) which are projected at both sides of a frame(60) apart one another 50 cm and are opposite to one another(Figure 7).

The length of the frame part is 45 cm.

The sensory test is put to the elastic top material(62) by sitting on the elastic woven fabric(10).

As a result, the elastic woven fabric(10) was estimated that it raised a difference of elongation between in the leftwise bias direction and in the rightwise bias direction, effected unstable and hard feeling, and was bad insitting feeling.

Comparison〔A－3〕

【0035】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 55 / 10cm .

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co. Ltd. "Dia-Flora") is applied to the weft yarn.

The fabric applied the plain weaves, shown in Figure 9, is woven with density of the weft 100 / 10cm .

The woven fabric is finished up as an elastic woven fabric by passing through dry-heating treatment at 190℃× for 3 minutes and by thermally adhering the warp yarn(11) and the weft yarn(22).

The elastic top material(62) is formed by hanging the elastic woven fabric(10) between frame parts and by fixing both edges of the fabric to the frame parts(61a, 61b) which are projected at both sides of a frame(60) apart one another 50 cm and are opposite to one another(Figure 7).

The length of the frame part is 45 cm.

The sensory test is put to the elastic top material(62) by sitting on

the elastic woven fabric(10).

As a result, the elastic woven fabric(10) was estimated that it does notraise a difference of elongation between in the leftwise bias direction and in the rightwise bias direction, but it effected unstable and hard feeling, bottomed sticky feeling and bad insitting feeling since the elastic fabric sagged awfully as a whole.

Property datum of Embodiment and Comparison 〔A〕

【0036】

(i) stress at 10% elongation(F_1; N/5cm) in the direction(X) where the elastic yarn(11) prolong, (ii) rate of hysteresis loss(ΔE_1) at 10 % elongation in the direction(X) where the elastic yarn(11) prolong, (iii) stress at 10% elongation(F_2; N/5cm) in the orthogonal direction(Y) crossing at right angles the direction(X) where the elastic yarns(11) prolong, (iv) rate of hysteresis loss(ΔE_2) at 10 % elongation in the orthogonal direction(Y) crossing at right angles the direction(X) where the elastic yarns(11) prolong, (v) 10% elongation stress(B_1; N/5cm) in 45 degrees leftwise bias direction(Z_1) where has left-wise inclination of 45 degrees against the prolonging direction(X), (vi) stress at 10% elongation(B_2; N/5cm) in the 45 degrees rightwise bias direction(Z_2) where has rightwise inclination of 45 degrees against the prolonging direction (X), (vii) bulk(J ; dtex/cm) of the elastic yarn(11), (viii) bulk(j ; d tex/cm) of the inelastic yarn(22), (ix) ratio(J / j) between bulk(J) of the elastic yarn(11) and density of bulk(j) of the intersecting inelastic yarn(22), (x) covering rate(K) of the elastic ya rn(11), (xi) rate of an intersection(H) of the elastic yarn(11), and (xii) product value (H×K) of rate of an intersection(H) and covering rate(K) of the elastic yarn(11) of the elastic fabrics(10) in above-mentioned embodiment and comparison are shown in following table(1).

〔 Table 1 〕

【0037】

	embodiment A－1	comparison A－1	comparison A－2	comparison A－3
stress at 10% elongation in the direction(X) (F_1; N/5cm)	350	351	360	331
rate of hysteresis loss in the direction(X) (ΔE_1)	30	32	28	35
stress at 10% elongation in the orthogonal direction(Y) (F_2; N/5cm)	147	152	320	58
rate of hysteresis loss in the orthogonal direction(Y) (ΔE_2)	42	41	42	28
stress at 10% elongation in leftwise bias direction(Z_1) (B_1; N/5cm)	26	33	109	37
stress at 10% elongation in rightwise bias direction(Z_2) (B_2; N/5cm)	25	20	86	38
bulk of the elastic yarn (J ; dtex/cm)	23920	23920	23920	20800
bulk of the inelastic yarn (j ; dtex/cm)	11000	11000	12130	11000
ratio of density(J) and density(j) (J / j)	2.17	2.17	1.97	1.89

covering rate of the elastic yarn (K)	5 2	5 2	5 2	4 6
rate of an intersection of the elastic yarn (H)	0. 5	0. 5	0. 5	1. 0
product value of rate of intersection(H) and covering rate(K) (H×K)	0. 2 6	0. 2 6	0. 2 6	0. 4 6
estimation	good	normal	bad	bad

【0 0 3 8】

Weft knitted fabric is more stretchable than warp knitted fabric and woven fabric, sages awfully, and effects cramped and unstable feeling at a time put limbs on it.

So that, in the case of forming an elastic fabric(10) as a weft knitted fabric, an inelastic yarn(13) is applied to a bace knitted and an elastic yarn(11) is knitted in the bace knitted fabric in a manner where the elastic yarn continues in line in the knitting width direction(Γ) over at least plural wales of at least one of plural courses so that its stress at 10% elongation(F) in the knitting length direction(Σ) can be designed more than 25 N/ 5 cm.

In this case, the bulk(J ; dtex/cm) of the elastic yarn is calculated as product value of the average fineness(T; dtex) of the elastic yarns (11) and the density of the arrangement(G ; number/cm) of the elastic yarns(11) which are arranged in the knitting length direction(Σ) and designed more than 17000 dtex/cm (J ≧ 17000 dtex/cm).

【0 0 3 9】

In this case, stress at 10% elongation(B) in 45 degrees bias direction(Z), where has inclination of 45 degrees against the prolonging direction(X) of the elastic yarns(11) is designed more than 5 % and less than 20 % of stress at 10% elongation(F) in the prolonging direction(X) of the elastic

weft knitted fabric($0.05 \times F \leqq B \leqq 0.20$).

【0040】

At this, 「to knit an elastic yarn(11) in the bace knitted fabric in a manner where the elastic yarn continues in line in the knitting width direction(Γ) over at least plural wales」 means that the elastic yarn may be knitted to form needle loops together with a inelastic yarn every plural wales in a manner to continue in line in the knitting width direction(Γ) such that the second inelastic yarn (13b) forms needle loops together with the first inelastic yarn(13a) over plural wales and continues without forming a needle loop over plural wales as shown in Figure 10.

As that, in the case where the elastic yarn is knitted to form needle loops together with a inelastic yarn every plural wales, it is possible to avoid that the portion of the elastic yarn which continues in line over plural wales without forming a needle loop slipe aside from the knitting width direction(Γ).

On the other hand, slippings of needle loops and sinker loops formed of the inelastic yarn are restrained by the elastic yarn and a sagging on the elastic fabric due to the weight of limbs increases, then, the lower stretching elastic fabric which does not effect painful cramped feeling can be obtained.

【0041】

Knitting textile design is not limited. Plain stitch knitting textile design, rib stitch knitting textile design and purl stitch knitting textile design may be applied to the bace knitted fabric.

The bace knitted fabric applied plain stitch knitting textile design of the weft knitted fabric(10) shown in Figure 11 is formed from the inelastic yarn(13) which is knitted in by replacing floating wales ($\sigma 1$, $\sigma 2$, $\sigma 3$ ………) every one course . In the course($\phi 1$, $\phi 2$, $\phi 3$), the first elastic yarn(11a) is inserted in the space between needle loops(40, 40) of adjacent wales($\sigma 1$, $\sigma 2$). In the course($\phi 4$, $\phi 5$), the first elastic yarn(11a) and the second elastic yarn(11b) of which elasticlties are different are inserted in the space between needle loops(40, 40) of adjacent wales($\sigma 1$, $\sigma 2$). In the course($\phi 6$), the first elastic yarn (11a), the second elastic yarn(11b) and the third elastic yarn(11c) of which elasticlties are different are inserted in the space between needle loops

(40, 40) of adjacent wales(σ1, σ2).

【0042】

In the case of the weft knitted fabric(10) shown in Figure 10, float stitch knitting textile design is applied and formed from the second inelastic yarn(13b) .

The second inelastic yarn(13b) forms a needle loop together with the first inelastic yarn(13a) every 6 needle loops(40a, 40b, 40c, 40d, 40e, 40f) in the course where the first inelastic yarn(13a) is knitted in.

The sinker loop(50), which is formed from the second inelastic yarn(13b), is extending in line in the knitting width direction(Γ) over 5 wales (σ2, σ3, σ4, σ5, σ6 / σ5, σ6, σ1, σ2, σ3) from the needle loop formed together with the first inelastic yarn(13a) and the second inelastic yarn (13b) to other needle loop formed together with the first inelastic yarn (13a) and the second inelastic yarn(13b).

【0043】

That is, in the case of the weft knitted fabric(10) shown in Figure 10, the second inelastic yarn(13b) is remained in the situation of yarn since it does not form needle loops over several wales.

Therefore, the elongation of the elastic yarn(11) is restrained by the second inelastic yarn(13b). Thus, the lower stretching elastic fabric which does not cause undulable puckers or climps and which does not effect painful cramped feeling can be obtained.

【0044】

In the case of the weft knitted fabric(10) shown in Figure 10, the elastic yarn(11) is inserted in the space between needle loops of adjacent wales(σ1, σ2) every other course(ϕ2, ϕ4, ϕ6) of the bace knitted fabric which is formed from the inelastic yarn(13) by applying rib stitch knitting textile design and by replacing floating wales(σ1, σ2, σ3 ………) every one course .

【0045】

Figure 12 shows the positional relationship of the needle loops(40) and the sinker loops(50) of the inelastic yarn(13) and the elastic yarn(11) which may be drawn in the knitting textile design paper wherein the needle loop and the sinker loop are drawn in the same shape.

However, the appearance of the needle loop(40) and the appearance of the

sinker loop(50) of the weft knitted fabric is not same.

Figure 13 shows the appearance of the weft knitted fabric which may be knitted according to the knitting textile design shown in Figure 12.

That is, in the weft knitted fabric shown in figures 12 and 13,

(i) average diameter of the elastic yarn(11) may be set up more than 1.5 times of average diameter of the inelastic yarn(13).

(ii) In the case of that average diameter of the elastic yarn is set up more than 1.1 times of average course interval(Lc) of the weft knitted fabric that is equal to the sum of average diameter of the elastic yarn(11) and average diameter of the inelastic yarn(13),

(iii) the needle loops(40) and the sinker loops(50) are push out toward the adjacent other course(ϕ1, ϕ3), where the elastic yarn is not threaded in , from the course(ϕ2) , where these loops are formed and the elastic yarn is threaded in , by the elastic yarn(11) which is threaded in its course(ϕ2).

(iv) In this case, the portions(13x) of the inelastic yarn(13) on the course(ϕ2) is inclined to the knitting width direction(Γ) and the knitting length direction(Σ).

(v) And, thease inclined portions(13x) form Λ-shaped appearance.

Therefore, such a pattern as diamond pattern is drawn on the surface of the elastic weft knitted fabric by the portions(13x) of the inelastic yarn (13).

【0046】

As this,

(i) average diameter of the elastic yarn(11) is set up more than 1.5 times of average diameter of the inelastic yarn(13),

(ii) average diameter of the elastic yarn is set up more than 1.1 times of average course interval(Lc) of the weft knitted fabric that is equal to the sum of average diameter of the elastic yarn(11) and average diameter of the inelastic yarn(13),

(iii) the inelastic yarn is under the elongated situation where tension acted to the inelastic yarn in the knitting process is stored inside of the inelastic yarn as latent shrinking stress ,

(iv) the inelastic yarn does not reduce its original relaxed situation disturbed by the thick elastic yarn after taken out from a weft knitting

machine, and

(v) the elongated situation of the inelastic yarn is kept by the thick elastic yarn and fixed.

That is, the elastic yarn;

(i) takes an action in the course(ϕ2) as a wedge picked in between the front course(ϕ1) and the rear course(ϕ3),

(ii) widens the space between these two courses(ϕ1, ϕ3) and brings the needle loops(40) and the sinker loops(50) formed in the course(ϕ2) into stretched situation, then

(iii) the needle loops(40) and the sinker loops(50) formed in the course (ϕ2) pull both front and rear needle loops(40) and sinker loops(50) formed in both front and rear courses(ϕ1, ϕ3) toward the course(ϕ2) and bring these loops(40, 50) into stretched situation.

As above, since the elastic yarn(11) takes an action in the course(ϕ2) as a wedge and brings the bace knitted fabric into stretched situation through needle loops and sinker loops, the bace knitted fabric, which is formed from inelastic yarn(13) and is telescopic in itself as a weft knitted products, is knitted up intelescopic.

On the other hand, since the elastic yarn(11) is thicker than the inelastic yarn(13), it is hardly elongated in the knitting process, so that, it is not fixed in elongated situation through the knitting process, it's elastic property is maintained after the knitting process.

In this mammer, the lower stretching elastic weft knitted fabric which does not effectpainful cramped feeling can be obtained.

【0047】

Thick elastic monofilament yarn of which fineness is more than 500 dtex, preferably more than 1000 dtex, further preferably more than 1650～3000 dtex and which has stress at 10% elongation of more than 0.1 cN/dtex, preferably 0.3～0.8 cN/dtex is applied for the elastic yarn(11) and is knitted in by hardly elongating in the knitting process.

Embodiment〔B－1〕

【0048】

An inelastic polyester multifilament yarn(fineness:500 dtex) is appli

ed to the base stitch yarn(13).

The bace knitted fabric applied the plain stitch knitting textile design, shown in Figures 12 and 13, is knitted with density of the wale 12 wales/25.4mm and density of the course 44 courses/25.4mm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the inserted yarn(11).

The inserted yarn(11) is interknitted in line weftwise every other course(ϕ2, ϕ4, ϕ6) in a manner where it passes over one needle loop(40) and passes under the next one needle loop(40) of the bace knitted fabric.

The weft knitted fabric is finished up as an elastic weft knitted fabric by passing through dry-heating treatment at 190 ℃× for 3 minutes.

In this mammer, the elastic weft knitted fabric where the inserted yarn thermally adhered to the bace knitted fabric is obtained.

Comparison〔B－1〕

【0049】

An inelastic polyester multifilament yarn(fineness:500 dtex) is applied to the base stitch yarn(13).

The bace knitted fabric applied the plain stitch knitting textile design, shown in Figures 12 and 13, is knitted with density of the wale 12 wales/25.4mm and density of the course 44 courses/25.4mm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the inserted yarn(11).

The inserted yarn(11) is interknitted in line weftwise every other course(ϕ2, ϕ4, ϕ6) in a manner where it passes over one needle loop(40) and passes under the next one needle loop(40) of the bace knitted fabric.

The weft knitted fabric is used for a elastic top material without dry-heating treatment.

Comparison〔B－2〕

【0050】

An inelastic polyester multifilament yarn(fineness:667 dtex) is applied to the base stitch yarn(13).

The bace knitted fabric applied the plain stitch knitting textile design, shown in Figure 10, is knitted with density of the wale 12 wales/25.4mm and density of the course 44 courses/25.4mm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the inserted yarn(11).

The inserted yarn(11) is interknitted in every third courses(φ2, φ5) of 6 courses(φ1, φ2, φ3, φ4, φ5, φ6) in line weftwise in a manner where it passes over one needle loop(40) and passes under the next one needle loop(40) of the bace knitted fabric.

The weft knitted fabric is finished up as an elastic weft knitted fabric by passing through dry-heating treatment at 190 ℃× for 3 minutes.

In this mammer, the elastic weft knitted fabric where the inserted yarn thermally adhered to the bace knitted fabric is obtained.

Property datum of Embodiment and Comparison〔B〕

【0051】

The elastic top material(62) is formed by hanging the elastic weft knitted woven fabric(10) obtained in above Embodiment[B-1], Comparison[B-1] and Comparison[B-2] between frame parts made of aluminum pipe, length 40 cm, of a frame(60) where these frame parts are aparted 40 cm .

The sensory test about cramped feeling, stable feeling, hardness, painful feel and fatigued feeling is put to the elastic top material(62) by sitting on the elastic woven fabric for 10 minutes.

【0052】

In the case of the elastic fabric of Embodiment[B-1], the portion where

touches to the buttocks sagged slightly, a repelllency of the sagged portion was not so hard, and cramped feeling, unstable feeling, hard painful feel and fatigued feeling were not felt.

【0053】

In the case of the elastic fabric of Comparison[B-1], it elongated largely in the knitting length direction, the portion where touches to the buttocks sagged largely, the periphery of the sagged portion effected cramped feeling, bottomed sticky feeling and fatigued feeling .

【0054】

In the case of the elastic fabric of Comparison[B-2], eventhough bottomed sticky feeling was not felt so hard as the case of Comparison[B-1], due to a roughness of the density of the arrangement of the elastic yarn the portion where touches to the buttocks sagged largely as a whole, and unstable feeling was felt.

【0055】

(i) stress at 10% elongation(F_c ;N/5cm) in the knitting width direction(Γ),

(ii) stress at 10% elongation(F_c ; N/5cm) in the knitting length direction(Σ) ,

(iii) rate of hysteresis loss ΔE which is calculated by the equation $\Delta E = 100 \times C / V = 100 \times (V - W) / V$; wherein

V is integral value which is calculated by integrating the load-reducing equation($f_1(\rho)$), which is defined by the reducing curve(f_1) of the hysteresis in the load-elongation diagram, from 0% to 10% elongation in the knitting width direction(Γ).

W is integral value which is calculated by integrating the load-elongation equation($f_0(\rho)$), which is defined by the loading curve(f_0) of the hysteresis in the load-elongation diagram, from 0% to 10% elongation in the knitting width direction(Γ).

$C = V - W$ is value of hysteresis loss which is calculated as the difference in the value between integral values V and W .

(iv) estimation in the sensory testof the elastic fabrics(10) in above-mentioned embodiment and comparison are shown in following table (2) .

〔 Table 2 〕

【0056】

	embodiment A－1	comparison A－1	comparison A－2
stress at 10% elongation in the direction (Γ) (F_c ; N/5cm)	392	349	277
stress at 10% elongation in the direction (Σ) (F_w ; N/5cm)	35	10	23
density of wale (wales/cm)	4.9	4.9	4.9
density of arrangement elastic yarn (number/cm)	8.98	8.98	6.94
bulk of elastic yarn (J) (dtex/cm)	18678	18678	14435
average course interval (Lc) (mm)	0.58	0.58	0.77
fineness of inelastic yarn (dtex)	500	500	667
average diameter of inelastic yarn (d) (mm)	0.224	0.224	0.258
fineness of elastic yarn (T) (dtex)	2080	2080	2080
average diameter of elastic yarn(D) (mm)	0.458	0.458	0.458
rate of sum of diameter of elastic yarn and inelastic yarn (D+d)	1.18	1.18	0.97

to course interval (Lc) (D +d) ÷ Lc			
rate of hysteresis loss in the direction (Γ) ΔE (%)	3 5	4 4	3 4
adhered situation of yarn in fabric	adhered	unadhere	adhered
estimation by sensory test	good	bad	bad

【0 0 5 7】

Sagging manner of the surface of the elastic fabric(10) and reaction from the elastic fabric(10) are partially changable according to stretching manner of the elastic fabric(10) and loading manner to the elastic fabric(10).

To avoid such a trouble, it is desirable to form the elastic fabric(10) in three-dimensional constructions with a face fabric(32) formed from face yarns(31) and a back fabric(34) formed from back yarns(33) and to apply the elastic yarn(11) to back yarns(33) at least as one kind of yarns.

【0 0 5 8】

According to such a manner, the elongation of the elastic yarn applied to the back fabric is restrained by the face fabric formed from the inelastic yarn, three-dimensional elastic top material which does not partially elongate and sag and is useful for sofa and mattress can be obtained.

【0 0 5 9】

In the case of forming the elastic fabric(10) in three-dimensional constructions, in the weaving or knitting process, the face fabric(32) and the back fabric(34) are simultaneously woven or knitted and are connected by one kind of face or back yarns.

In the case of weaving, three-dimensional elastic double fabric may be woven as one kind of warp-weft-double woven fabrics by using a conventional loom.

Three-dimensional elastic double fabric knitted by using the weft knitting machine is shown in Figure 14. At one portion of the fabric, double

stitch opening is formed with the face yarn(31) and the back yarn(33). The face fabric(32) and the back fabric(34) are connected through the double stitch opening. Between the face fabric(32) and the back fabric(34), the interspace stratum (36) may be formed.

Three-dimensional elastic double fabric woven by using the double moquette loom is shown in Figure 15. The face fabric(32) is formed in plain weave textile design with the face warp yarn(31y) and the face weft yarn(31x). The back fabric(34) is formed in plain weave textile design with the back warp yarn(33y) and the back weft yarn(33x). The interspace stratum (36) is formed between the face fabric(32) and the back fabric(34) which are connected by the connecting yarn(35).

【0060】

Three-dimensional elastic double fabric knitted by using the double raschel warp knitting machine is shown in Figure 16. The face fabric(32) and the back fabric(34) are connected by the connecting yarn(35).

The thickness of the interspace stratum (36) formed between the face fabric(32) and the back fabric(34) may be designed more than 0.3 mm.

The elastic yarn is used for the back yarn(33) and the connecting yarn (35), and the inelastic yarn is used for the face yarn(31). The face yarns (31) forms two kinds of chain stitch openings(38a, 38b) alternately every several courses. The each of the two kinds of chain stitch openings(38a, 38b) is formed over several courses. One(38a) of the two kinds of chain stitch openings is formed together with one(31a) of the face yarns and other face yarn(31b) which is adjacent left side of the one(31a) of the face yarns in the knitting width direction(Γ), and another one(38b) of the two kinds of chain stitch openings is formed together with the one(31a) of face yarns and another face yarn(31c) which is adjacent right side of the one(31a) of face yarns in the knitting width direction(Γ).

Consequently, this two kind of chain stitch openings(38a, 38b) are to form the chain stitch opening row(39) extending in the knitting length direction (Σ) in a zigzag manner.

And, openings(37) having opening area may be more than 1 mm^2 are formed between adjacent chain stitch opening rows(39, 39), three-dimensional elastic double fabric is knitted up in mesh shape as a knitted net fabric.

The back fabric(34) is formed with the ground stitch back yarn(33a) for

forming the chain stitch opening row(39) extending in the knitting length direction(Σ) and the inserted back yarn(33b) which is applied for connecting adjacent chain stitch opening rows(39, 39) without forming a needle loop.

【0061】

Three-dimensional elastic double fabric is superior in warmth keeping property since the interspace stratum(36) having bag like opening is formed between the face fabric(32) and the back fabric(34).

In the three-dimensional elastic double fabric, eventhough the back fabric(34) may be formed in thick, touch feeling of the face fabric(32) is not spoiled, eventhough the face fabric(32) may be formed in mesh shape as a knitted net fabric, the shape of the face fabric(32) is maintained in stable by the thick back fabric(34).

【0062】

So that, the elastic top material(62) which is superior in cushioning property, does not give stuffy feeling and is useful for sofa and mattress, may be obtained by using such a three-dimensional elastic double fabric(10) that thickness of the stratum(36) is designed more than 0.3 mm. Since, such thick three-dimensional elastic double fabric(10) is superior in cushioning property, warmth keeping property, and air-permeability so that air flows out from and into the interspace stratum(36) every time when it receives cushioning action.

【0063】

Thus, the three-dimensional elastic double fabric, of which the face fabric is formed in mesh shape, becomes suitable for sofa and mattress.

【0064】

Especially, the three-dimensional elastic double fabric, wherein the elastic yarn(11) is applied for the connecting yarn(35), is superior in cushioning , becomes suitable for sofa and mattress, and does not effect stuffy feeling.

【0065】

When, the limbs is put on such a cushioning surface where limbs and body may come into contact with is formed and maintained in plain as a plate by straining very strongly and by hanging the elastic fabric over the frame of the elastic top material(10), the reaction acts to limbs from the

cushioning surface must cause painful feel and fatigued feeling and it becmes unbearable to put the limbs on for a long time.

【0066】

In this regard , in accordance with the present invention, the tensile stresses, which act in any one of yarns continuous direction and also act respectively at least 2 apart portions being apart in the other direction crossing at right angles to that one of yarns continuous direction and also act at regular rate of elongation of the elastic fabric, are designed in various.

That is, the elasticlty of the cushioning surface is designed partially in various in a manner of that at one portion, where heavy load acts, sages largely and forms a deep recess, and other portion, where heavy load does not act, sags preferably and forms shallow recess.

In such a manner, the cushioning surface becomes into to fit the shape of limbs.

So that, in accordance with the present invention, the elastic top material(10) which does not effect painful feel and fatigued feeling when limbs is put on the cushioning surface for a long time can be obtained.

【0067】

In the present invention, 「the tensile stress at regular rate of elongation of the elastic fabric (hence called" regular tensile strengh ") 」 means the tensile stress which acts to the elastic fabric at a time it is elongated and it's rate of elongation reachs at regular rate of elongation that is needed to compare the stretching elasticity of different portions of the cushioning surface which may be formed from the elastic fabric.

It is preferable to set the "regular tensile strengh" by the press load which is measured at a time when rate of elongation reachs at regular rate of elongation in a measuring process where press loads is applied to different portions of the cushioning surface where stretching elasticity is to be compared by increasing the press loads till rate of elongations reach the regular rate of elongation which may be set up 3 % ～ 10 % elongation.

【0068】

In the present invention, "at least 2 apart portions being apart in the other direction crossing at right angles to any one of yarns

continuous direction" means following 2 portions;

(i) in the case of elastic fabric which is formed only with the warp yarn(18) as a warp knitted fabric wherein the warp yarn(18) is in continuous in the length direction(h) of the fabric, 2 portions(r-1, r-2) which are apart from one another in the width direction(r), that is, portion(r-1) formed with a warp yarn(18a) is apart from portion(r-2) formed with other warp yarn(18b) (Figure 17) .

(ii) in the case of elastic fabric which is formed only with the weft yarn(19) as a weft knitted fabric wherein the weft yarn(19) is in continuous in the width direction(r) of the fabric, 2 portions which are apart from one another in the length direction(h), that is, portion(h-1) formed with a weft yarn(19a) is apart from portion(h-2) formed with other weft yarn(19b) (Figure 18) .

(iii) in the case of elastic fabric which is formed with the warp yarn (18) which is continuous in the length direction(h) of the fabric and the weft yarn(19) which is in continuous in the width direction(r) of the fabric as a weft inserted warp knitted fabric and a woven fabric, 2 portions (r-1, r-2) which are apart from one another in the width direction(r) and another 2 portions(hr-1, hr-2) which are apart from one another in the length direction(h) of the fabric, that is, 4 portion (r-1, r-2, hr-1, hr-2) wherein the yarns are different in connection with either warp yarns(18) or weft yarns(19b) (Figure 19) .

【0069】

As shown in Figure 19, it is desirable for the partial variation of the regular tensile strengh to thread several various kinds of yarn in respectively different any one of the directions which cross at right angles.

That is, for the partial variation of the regular tensile strengh between two portions, two kinds of yarn are threaded in parallel into respectively different two portions where are apart from one another in the direction where other yarn is in continuous in its length direction and is across the direction where those two kinds of yarn may be in continuous.

【0070】

Such two portions can be shown in Figure 19, wherein the elastic fabric is formed with the warp yarn(18) which is in continuous in the length

direction(h) of the fabric and the weft yarn(19) which is in continuous in the width direction(r) of the fabric such as a weft inserted warp knitted fabric and a woven fabric. Therein, two kinds of yarn may be applied for the warp yarn(18) and the weft yarn(19). At either two portions(r-1, r-2) which are apart from one another in the width direction (r) or other two portions(hr-1, hr-2) which are apart from one another in the length direction(h) of the fabric, either the kind of warp yarns(18) of the portion(r-1) and the portion(r-2) or the kind of weft yarns(19) of the portion(hr-1) and the portion(hr-2) are varied.

【0071】

In the present invention, such two portions being apart from one another in the direction being across the direction where yarns is in continuous and regular tensile strengh acts, that is, positions of which regular tensile strengh are different one another are called " regular strengh different positions".

In the case of the weft knitted fabric shown in Figures 10 ～ 13, the"regular strengh different positions"are shown as the courses(ϕ1, ϕ2, ϕ3, ϕ4, ϕ5 ………) where several various kinds of yarn can be selectively thread in for variation of the"regular tensile strengh" according to the kinds of yarn.

So that, in the case of the elastic top material(62) which is formed by fitting the knitting width direction(Γ) to the width direction of the frame(i) and by stretching and hanging the elastic weft knitted fabric(10) between frame parts(61a, 61b)(Figure 20), it becomes possible to vary the "regular tensile strengh" is to act in the width direction at every portion in the depth direction(q).

【0072】

In the cases of the warp knitted fabric and the warp inserted warp knitted fabric shown in Figures 1 ～ 3 , the "regular strengh different positions" are shown as the wales(σ1, σ2, σ3, σ4, σ5 ………) where several various kinds of yarn can be selectively thread in to vary the "regular tensile strengh" according to the kind of yarn.

So that, in the case of the elastic top material(62) which is formed by fitting the knitting length direction(Σ) to the width direction of the frame(i) and by stretching and hanging the elastic weft knitted fabric(10)

between frame parts(61a,61b)(Figure 20), it becomes possible to vary the "regular tensile strengh" is to act in the width direction at every portion in the depth direction(q).

【0073】

In the case of the weft inserted warp knitted fabric shown in Figure 2 , the "regular strengh different positions" are shown as the course(ϕ 1, ϕ 2, ϕ 3, ϕ 4, ϕ 5 ………) where several various kinds of yarn can be selectively thread in for the variation of the "regular tensile strengh" according to the kinds of yarn and as the wales(σ 1, σ 2, σ 3, σ 4, σ 5 ………) where several various kinds of yarn can be selectively thread in for the variation of the "regular tensile strengh" according to the kinds of yarn.

Therefore, in the case of the elastic top material(62) which is formed by fitting the knitting length direction(Σ) to the width direction of the frame(i) and by stretching and hanging the elastic knitted fabric between frame parts(61a,61b) (Figure 20), when the weft inserted warp knitted fabric wherein several kinds of yarn being various in the stretching elasticity are selectively threaded in the the wales(σ 1, σ 2, σ 3, σ 4, σ 5 ………) is applied to cushioning surface(74), it becomes possible to vary the "regular tensile strengh" is to act in the width direction at every portion in the depth direction(q) of the elastic top material(62) (Figure 2).

Also, in the case of the weft inserted warp knitted fabric shown in Figure 2 , when it is knitted by selectively threaded several kinds of yarn, which are various in the stretching elasticity, into the wales or the courses, a check pattern with crosswise stripes(75) and a lengthwise stripes(76) is drawn depend on the difference of the kind of the yarn and the "regular tensile strengh" which may be act in both width and depth directions(i, q) at the "regular strengh different positions" becomes variable (Figure 2).

Of course, in the case of the weft inserted warp knitted fabric which is knitted by selectively threaded several kinds of yarn, which are various in the stretching elasticity, into the courses(ϕ 1, ϕ 2, ϕ 3, ϕ 4, ϕ 5 ………) only , when the weft inserted warp knitted fabric is stretched and hanged between frame parts(61a,61b) by fitting the knitting length direction(Σ)

to the width direction of the frame(i), it is possible to vary the "regular tensile strengh", which may be act in the depth direction(q), at every portion in the width direction(i).

【0074】

In the cases of the woven fabric, the"regular strengh different positions" are different positions in the width direction(r) where several various kinds of warp yarn(18) can be selectively arranged and different positions in the weaving length direction(h) at where several various kinds of weft yarn(19) can be selectively picked into the shed between warp yarns(18, 18).

Therefore, in the case of that the woven fabrics shown in Figures 17 ～ 19 , are applied for the elastic top material, in the same way of the application of the weft inserted warp knitted fabric shown in Figure 2 , a check pattern with crosswise stripes(75) and lengthwise stripes(76), a crosswise stripe pattern and a lengthwise stripe pattern may be drawn depend on the difference of the kind of the yarn, and the"regular tensile strengh" which may be act in both width and depth directions(i, q) at the regular strengh different positions becomes variable.

【0075】

As that, in the case of that several various kinds of yarn are selectively applied to the"regular strengh different positions"of elastic fabric, check patterns and stripe patterns tend to appere on the cushioning surface in accordance with differences of such a specification of the yarn as finenesses, numbers of twist, meterials of fiber and a like (Figure 20).

【0076】

First means to avoid such an apperance is that specifications of lower stretch yarn and high stretch yarn , which are applied as several various kinds of yarn, are to be designed even, and that textile design of woven a nd knitted fabric, density of warp and weft of woven fabrics, density of warp and weft of knitted fabrics at the "regular strengh different positions" are to be designed even.

Other manner to avoid above apperance is that the surface of the "regular strengh different positions" are to be covered with cut piles, loop piles, or fluffs formed from the yarns which are even in connection with dyeing property, fineness, number of twist, meterial of fiber, and a like.

In the case of that the elastic fabric is formed in shape of double

fabric with a surface stratum formed from face yarns and a back stratum formed from back yarns, lower stretch yarns which are even in connection with meterial of fiber, fineness, number of fiber, number of twist are preferably applied for the surface stratum of the "regular strengh different positions".

【0077】

The elastic yarn of which fineness more than 300 dtex is bar shape and it's surface is flat and slippery. Therefore, the surface of the elastic fabric is also flat and slippery. And, when limbs is put on the elastic top material formed from such elastic fabric, limbs can not be maintained in comfortable posture, and fatigued feeling must be felt.

【0078】

Then, in accordance with the present invention, average frictional modulus of elasticity(ω) of the surface of the elastic fabric is designed more than 0.26($0.26 \leqq \omega$) by appl-ing a non-slip yarn, which has fine fibers of a single fiber fineness less than 30 dtex, to the elastic fabric, and by floating out the fine fibers over the surface of the elastic fabric in a manner of that the fine fibers float out or the non-slip yarn exposes at least among a rectangular area of 1 cm^2 (lengthwise 1 cm × crosswise 1 cm). At this, average frictional modulus of elasticity(ω) of the surface of the elastic fabric is calcurated through following steps.

【0079】

(Step i)

A rectangular test fabric taken out from the elastic fabric, size lengthwise 20 cm× crosswise 20 cm, is spreaded over and fixed on the surface of metal plate which is finish in mirror plane and supported horizontally.

(Step ii)

Stainless rectangular contact segment having 20 lines of cut channel of width 0.1 mm and depth 0.1 mm over the undersurface, size lengthwise 10 mm × crosswise 10 mm, is put on the test fabric.

(Step iii)

Load of 50 gf is set on the test fabric through the contact segment.

(Step iv)

The contact segment is moved at speed of 0.1 mm/second to and from

30 mm in the right angled direction of the cut channel.

(Step v)

Frictional modulus of elasticity(ω_1) in the longitudinal direction of the elastic fabric is calculated by dividing the average value of the frictional force(F_1 ; gf) between the contact segment and the test fabric by the load(50 gf).

Frictional modulus of elasticity(ω_2) in the lateral direction of the elastic fabric is calculated by dividing average value of the frictional force(F_2 ; gf) between the contact segment and the test fabric by the load(50 gf).

Average frictional modulus of elasticity(ω) of the surface of the elastic fabric is calculated as average($0.5\omega_1 + 0.5\omega_2$) of frictional modulus of elasticity(ω_1) in the longitudinal direction and frictional modulus of elasticity(ω_2) in the lateral direction.

【0080】

A reason to make the fine fibers float out or to make the non-slip yarn expose among the rectangular area of 1 cm^2 of the surface of the elastic fabric is that the elastic fabric may be formed in similar to conventional fabric which is made from a fiber of fineness less than 30 dtex.

【0081】

A reason to set the size of measuring area in lengthwise 10 mm × crosswise 10 mm by the undersurface of the contact segment is that a non-slip effect caused by the non-slip yarn can not expect a porous fabric of which the space between yarns is designed more than 10 mm.

So that, it is required to distribut equably the fine fibers of fineness less than 30 dtex over the whole surface of the elastic fabric for the non-slip effect due to the non-slip yarn.

【0082】

That is, the present invention intends to relatively minimize ratio of exposing area of the thick and slippery elastic yarn through existence of the fine fibers of fineness less than 30 dtex.

【0083】

However, it needs not to completely cover the surface of the elastic fabric with the fine fibers of fineness less than 30 dtex.

Since, the surface of the elastic fabric is in need of somewhat slippery

as far as natural demeanor and posture of limbs are not restrained on it and it effects comfortable feeling.

In consideration of these matters, average frictional modulus of elasticity(ω) of the surface of the elastic fabric is to be designed less than 0.60 ($0.26 \leqq \omega \leqq 0.60$), preferably within 0.30 ~ 0.50 ($0.30 \leqq \omega \leqq 0.50$), further preferably within 0.35 ~ 0.40 ($0.35 \leqq \omega \leqq 0.40$).

For that, ratio of exposing area of the non-slip yarn in the measuring area , lengthwise 10 mm × crosswise 10 mm , may be generally designed less than 50 % , preferably within 5 % ~ 30 % , further preferably within 15 % ~ 25 % (generally about 20 %).

【0084】

Following yarns can be used for the non-slip yarn .

(i) spun yarn and napped multifilament yarn having float fluffs,

(ii) ring yarn having ring like bumpy surface formed by annex yarns climb up a core yarn,

(iii) slub yarn having slub like bumpy surface formed by annex yarns climb up a core yarn,

(iv) nep yarn having nep like bumpy surface formed by annex yarns climb up a core yarn,

(v) seath core conjugate yarn having bumpy surface formed by covering core yarn by seath yarn,

(vi) interlace yarn having bumpy surface formed by over feeding multifilament,

(vii) chenille yarn formed by fixing decorative yarn to core yarn,

(viii) flocky yarn formed by electrostatically fixing fiber fragment to core yarn,

(ix) cord yarn having napped surface formed by cutting natural leather, synthetic leather, artificial leather, non-woven fabric and a like .

【0085】

The elastic fabric may be finished by raising its surface to nap the surface of the non-slip yarn exposed thereon.

In the case of application of conventional spun yarn and multifilament yarn for the non-slip yarn, the surface of the elastic fabric may be covered with piles formed by these conventional yarns .

In this connection, it is desirable to use chenille yarns and flocky yarns as the non-slip yarn, since the surface of these yarn's are covered with piles.

【0086】

In the case of that the elastic fabric is formed in a shape of double fabric with a surface stratum formed from face yarns and a back stratum formed from back yarns, it is desirable to apply the elastic yarn to the back fabric(34) and apply the non-slip yarn to the face fabric(32).

Embodiment〔C－1〕

【0087】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 64/10cm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer · and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co. Ltd."Dia-Flora") is applied to the first weft yarn.

A chenille yarn(fineness: meter count of 1/2.8) made by applying a multifilament texturiged yarn(fineness: 167 dtex) to a decorative yarn and by appling a polyester spun yarn(fineness:cotton count of 20, single fiber fineness: 1.4 dtex) and a thermo adhesible nylon monofilament yarn (fineness: 78 dtex) to a core yarn is applied to the second weft yarn.

The fabric applied the twill weaves is woven by inserting reciprocally the first weft yarn and the second weft yarn every picking with density of the weft 120 / 10cm .

The woven fabric is finished up as an elastic woven fabric(10) by passing through dry-heating treatment at 190℃ × for 3 minutes and by thermally adhering the warp yarn and the weft yarn.

Stress at 10% elongation(F) in the width direction(r) of the elastic woven fabric(10) is 217 (N/ 5 cm).

Frictional modulus of elasticity(ω_h) in the weaving length direction of the elastic woven fabric(10) is 0.375 .

Frictional modulus of elasticity(ω_r) in the weaving width direction

of the elastic woven fabric(10) is 0.387 .

Average frictional modulus of elasticity(ω) of the surface of the elastic fabric is 0.381 .

Embodiment 〔C－2〕

【0088】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 64 / 10cm .

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the first weft yarn.

A chenille yarn(fineness: meter count of 1/2.8) made by applying a multifilament texturiged yarn(fineness: 167 dtex) to a decorative yarn and by appling a polyester spun yarn(fineness:cotton count of 20, single fiber fineness: 1.4 dtex) and a thermo adhesible nylon monofilament yarn (fineness: 78 dtex) to a core yarn is applied to the second weft yarn.

A ring yarn(fineness:meter count of 1/3.8) made by applyinga polyester multifilament yarn(fineness: 501 dtex(167×3),single fiber fineness:3.4 dtex) to an annex yarn , by applying a multifilament texturiged yarn (fineness: 166 dtex(83×2), single fiber fineness: 3.4 dtex) to a core yarn , and by applying a multifilament texturiged yarn(fineness: 83 dtex, single fiber fineness: 3.4 dtex) and a multifilament texturiged yarn (fineness: 167 dtex ,single fiber fineness: 3.4 dtex) to a bind yarn , is applied to the third weft yarn (non-slip yarn).

The fabric applied the twill weaves is woven by inserting the first weft yarn and the second weft yarn and the third weft yarn in order with density of the weft 136 / 10cm .

The woven fabric is finished up as an elastic woven fabric(10) by passing through dry-heating treatment at 190℃ × for 3 minutes and by thermally adhering the warp yarn and the weft yarn.

Stress at 10% elongation(F) in the width direction(r) of the elastic woven fabric(10) is 266 (N/ 5 cm).

Frictional modulus of elasticity(ω_h) in the weaving length direction of the elastic woven fabric(10) is 0.398 .

Frictional modulus of elasticity(ω_r) in the weaving width direction of the elastic woven fabric(10) is 0.391 .

Average frictional modulus of elasticity(ω) of the surface of the elastic fabric is 0.385 .

Comparison [C − 1]

【0089】

A polyester spun yarn(fineness: 2 ply/meter count of 10 in single yarn) is set in warping with density of the warp of 64/10cm.

A thermo adhesible seath core conjugate polyether-ester elastic yarn made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer(fineness: 2080 dtex, product name of Toyobo Co.Ltd."Dia-Flora") is applied to the weft yarn.

The fabric applied the twill weaves is woven with density of the weft 136 / 10cm .

The woven fabric is finished up as an elastic woven fabric(10) by passing through dry-heating treatment at 190℃ × for 3 minutes and by thermally adhering the warp yarn and the weft yarn.

stress at 10% elongation(F) in the width direction(r) of the elastic woven fabric(10) is 403 (N/ 5 cm).

Frictional modulus of elasticity(ω_h) in the weaving length direction of the elastic woven fabric(10) is 0.202 .

Frictional modulus of elasticity(ω_r) in the weaving width direction of the elastic woven fabric(10) is 0.273 .

Average frictional modulus of elasticity(ω) of the surface of the elastic fabric is 0.238 .

Industrial Applcability

【0090】

In accin accordance with the present invention, weight of limbs loaded

on the elastic fabric disperses in all directions, sagged recess is formed there according to the shape of limbs, bottomed sticky feeling is not felt, undulatory puckers or climps do not appere over the surface of the elastic fabric.

Thus , the elastic fabric which are rich in soft feeling and load-hysteresis fatigue resistance can be obtained.

When the elastic fabric is hanged over and fixed to both its edges to frame parts, which are projected at both sides of a frame , and which are apart from and in opposite to one another,
an elastic top material which is smallsized, easy to deal with, light weight not bulky, and limds may be supported in stable can be obtained.